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**DEPARTMENT OF THE ARMY  
US Army Corps of Engineers  
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EM 1110-1-1005

Manual  
No. 1110-1-1005

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**Engineering and Design  
CONTROL AND TOPOGRAPHIC SURVEYING**

**1. Purpose.** This manual provides guidance on performing detailed site surveys of military installation facilities and civil works projects. Technical specifications, procedural guidance, and quality control criteria are outlined for developing large-scale site plans used for engineering drawings of planned projects, or detailed as-built feature mapping of completed facilities.

**2. Applicability.** This manual applies to all USACE commands having responsibility for the planning, engineering and design, operation, maintenance, construction, and related real estate and regulatory functions of military construction, civil works, and environmental restoration projects. It is intended for use by hired-labor personnel, construction contractors, and Architect-Engineer (A-E) contractors. It is also applicable to surveys performed or procured by local interest groups under various cooperative or cost-sharing agreements.

**3. Discussion.** Control and topographic surveys are performed to determine the planimetric location and/or elevation of surface or subsurface features, facilities, or utilities. These surveys are normally used to prepare highly detailed site plan maps (and digital databases) of a project site, facilities, or utility infrastructure; for future design, on going construction, or as-built condition. Engineering drawing scales are typically large--ranging between 1 inch = 30 ft and 1 inch = 100 ft. These surveys are performed over relatively small project sites using tripod-mounted, manually operated, terrestrial survey equipment, such as transits, tapes, levels, plane tables, electronic total stations, and GPS receivers. This manual covers the field survey techniques, instrumentation, and electronic data collection systems that are used in performing these ground-based field surveys, and transferring observed data into facility management or design databases. Also included are methods for extending geodetic control needed for supplemental topographic mapping work on a military installation or civil works project site. This manual also includes procedures for transferring field data to computer-aided drafting and design (CADD) systems or geographic information systems (GIS) used in planning, engineering, construction, and facility management. Aerial topographic mapping techniques are not addressed in this manual--see EM 1110-1-1003 (*Photogrammetric Mapping*). FM 3-34.331 (*Topographic Surveying*) should be consulted for tactical field surveying operations supporting field artillery (FA), air-defense artillery (ADA), aviation (e.g., airfield NAVAID and obstruction surveys), intelligence, communications, or construction.

FOR THE COMMANDER:

12 Appendices  
(See Table of Contents)

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This manual supersedes EM 1110-1-1005, Topographic Surveying, 31 August 1994 and EM 1110-1-1004, Geodetic and Control Surveying, 01 June 2002.